Page 1 before the first paragraph, has been amended to include the following insert:

This application claims priority to International Application No. PCT/DE99/02026 which was published in the German language on June 28, 1999.

Page 1 between lines 5 and 6 has been amended to include the following heading:

TECHNICAL FIELD OF THE INVENTION

Paragraph beginning on line 6 of page 1 has been amended as follows:

The invention relates to communications system, and in particular, to an optimized communications system for radio-assisted traffic services such as railroad services.

Page 1, between lines 10 and 11 has been amended to include the following heading:

BACKGROUND OF THE INVENTION

Paragraph beginning on line 11 of page 1 has been amended as follows:

Point-based or line-based train influence is used for controlling railroad operations. In point-based train influence, limited amounts of specific information items at fixed-position influencing devices is transmitted to vehicles moving past the devices. The information items may be evaluated, and if necessary, processed further at the device. In line-based train influence, more information can be exchanged for greater vehicle control and monitoring. Information can be continuously transmitted from a section of the track to the vehicles and, if necessary, in the opposite direction. Information is normally transmitted by means of linear conductors laid in the track, to which at least individual vehicles of the trains passing through that section are inductively coupled. Due to the complexity of installation, the operation and maintenance of the linear conductors laid in the track is considerable. For this reason, the prior art contemplates data which is transmitted between the individual subscribers by radio. A mobile radio system can be used for this purpose, as is already used for voice and data transmission and is described in EP 0

726 689 A2. The data to be transmitted for controlling railroad vehicles is, in contrast to voice radio data, safety-relevant since it affects the vehicle control directly. Care must therefore be taken in a suitable way to ensure that the data cannot be corrupted or lost on their way from the data source to the data sink. Cryptographic methods are nowadays widely used for the security of such data.

Paragraph beginning on page 5, line 4 has amended as follows:

One special feature of railroad operation is that the data to be transmitted to the trains are produced in a decentralized manner by individual control stations or control points. Data transmitted via linear conductors, to a train is typically linked to a single control point and, on entering a subsequent section region, is automatically changed over to the control point responsible for that section. With radio train influencing, this automatic association, which is dependent on the decentralized features of the rail system, with the respectively responsible control point is no longer provided. In fact, the vehicle or the control point responsible for the vehicle for this purpose, and on the basis of the known location of the vehicle on the section, either has to request the control center ~~to~~ set up a link to the train which is approaching its section region, or cause the vehicle to set up this link. A specific time interval in the order of magnitude of up to 10s is in each case required for this purpose. In this time, the locomotive of a train is still linked to the control center of the section region over which it is travelling and is thus busy with setting up a link to the control center of the next region. The vehicle needs to have at least two radios for this purpose.

Paragraph beginning on line 30 of page 5 has been amended as follows:

One very major problem with regard to data transmission in decentralized systems, such as railroad systems, is also presented by the central services, for example those for disposition and central diagnosis. Special radio channels are either provided for these central services, although this is scarcely feasible owing to the limited resources, or else these central services

communicate with the trains via the communications modules of the decentralized controllers. In the latter case, however, the link between the central services and the trains must be continuously readjusted to match the current locations of the trains. That is, the data for the central services have to be continually switched to the communications modules of the adjacent control centers. This results in gaps in the transmission of data, in particular due to synchronization processes, in the order of magnitude of several seconds. Furthermore, a disadvantage of this constellation is that central services which are making a request to a vehicle must first of all determine which control center is currently linked to the relevant vehicle.

Paragraph beginning on line 11 of page 7 has been amended as follows:

In implementations based on the central solution approach, each train has a fixed substitute in a gateway computer on the section side (fixed relationship between the mobile object and the gateway computer). Consequently, calls and data always have to be passed via a fixed-position node, irrespective of where the train is located. The resultant communications paths are consequently long, resulting in high operating costs. Furthermore, the substitute relationships to the mobile objects have to be configured and maintained individually in each gateway computer and each mobile object, which leads to high engineering and maintenance costs.

Page 7, between lines 23 and 24 please insert the following paragraphs:

SUMMARY OF THE INVENTION

In one embodiment of the invention, there is an optimized communications system for radio-assisted traffic services for radio transmission of data between mobile objects and central services and fixed-position objects, which have decentralized control centers, using at least one gateway computer. Communication between the mobile objects and the fixed-position objects is implemented via the gateway computers such-that for the mobile objects which communicate with the gateway computers, one substitute object is in each case set up in the gateway computer

and in the fixed-position objects. For the fixed-position objects which communicate with the gateway computers, substitute objects are set up directly in the gateway computer or indirectly via at least one information server, and an when an update process is used, the substitute information in the gateway computer and in the fixed-position objects is updated directly between the substitute objects in the gateway computer and the fixed-position objects, or indirectly between the gateway computer and the information server. In one aspect of the invention, if information servers are connected between the gateway computers and the central services as well as decentralized control centers, the update information is cascaded, and compressed information about accessible mobile objects is produced in the information server.

In another aspect of the invention, the compressed information can be called by fixed-position objects.

In still another aspect of the invention, the information servers actively communicate with fixed-position objects and filter and/or distribute update information.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described in more detail in the following text with reference to exemplary embodiments, at least some of which are illustrated in the figures, in which:

Figure 1 shows a variant of optimized radio communications by means of a decentralized link map.

Figure 2 shows a variant of optimized radio communications by means of a central link map.

Figure 3 shows a variant of optimized radio communications by means of a central and decentralized link map.

DETAILED DESCRIPTION OF THE INVENTION

Paragraph beginning on line 24 of page 7 has been amended as follows:

The invention relates to an optimized communications system for radio-assisted traffic services which, using simple means, allows reliable data traffic via effective communications paths with only one radio transmission channel between the mobile objects and the fixed-position objects, and which minimizes the outlay for setting up the system, updating the system and maintenance of the system.

Please delete the paragraph on page 7, lines 32-35.

Please delete the paragraphs on page 11, line 29 - page 12, line 4.

Paragraph beginning on line 22 of page 12 has been amended as follows:

An update process between the substitute objects in the gateway computer and the fixed-position objects updates the substitute information in the gateway computer and in the fixed-position objects when changes occur (for example setting up a new substitute object on establishing radio communication with another train.) The update process is optimized to the requirements for delay time, throughput etc.

Paragraph beginning on line 10 of page 13 has been amended as follows:

Information servers can be included for cascading the update information, as illustrated in Figure 2. In this case, the information relating to accessible mobile objects and associated gateway computers is stored in an intermediate, fixed-position information server rather than in the central services and decentralized control centers. An update process is used between the information server and gateway computer. Compressed information about accessible mobile subscribers for different gateway computers is thus available in the information server. This information can be called up by other fixed-position objects which wish to access mobile communications subscribers (information function). If desired, the information server can take

the initiative for communication with fixed-position objects, and can filter and distribute update information (change service). Mixed variants with and without the interposition of information servers are also feasible, as shown in Figure 3. The respective configuration depends on the communication requirements for the applications (for example communication frequency, time requirements).

Paragraph beginning on line 6 of page 16 has been amended as follows:

First: Transmission of signaling information between a fixed-position object and an information server. The purpose of this communication is to search for a destination (information about the gateway computer to be selected). Communication between a fixed-position object and an information server may either be initiated by the railroad service (information call), or may be on the initiative of the information server (change service). Once signaling has taken place, the communication between the fixed-position railroad service and the information server is ended.

Paragraph beginning on line 16 as been amended as follows:

Second: Setting up the data link between the fixed-position railroad service and a mobile object via the gateway computer which has been determined.

On page 1, line 1, please replace "Patent Claims" with What is claimed is:

In the Claims:

1. (Amended) An optimized communications system for radio-assisted traffic services for radio transmission of data between mobile objects and central services and fixed-position objects, which have decentralized control centers, using at least one gateway computer, wherein

communication between the mobile objects and the fixed-position objects is implemented via the gateway computers such that